



Forecasting Selenium Discharges to the San Francisco Bay-Delta Estuary: Ecological Effects of A Proposed San Luis Drain Extension

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- discharges of irrigation drainage conveyed from agricultural lands of the western SJV via the SJR or potentially from an extension of the SLD;
- effluents from the North Bay refineries which refine crude oil from the western SJV along with crude oil from other sources;
- Sacramento River inflows which is the dominant freshwater inflows (high water volume) to the Bay-Delta; and

Effluents from Bay-Delta wastewater treatment plants and industries other than refineries are minor sources of Se (Cutter and San Diego-McGlone, 1990) and will not be considered further.

Inputs of Selenium from Agriculture in the Western San Joaquin Valley

The problem

The Coast Ranges, which border the SJV on the west, are composed of marine sedimentary rocks that are enriched in Se (Figures 3 and 5) (Presser and Ohlendorf, 1987; Presser et al., 1990). An internal reservoir of salt (and by inference Se) has accumulated through 1.0 to 1.2 million years within the SJV soils and aquifers as a result of runoff and erosion from the Coast Ranges (Bull, 1964; Milam, 1985; McGuire, 1988; Deverel and Gallanthine, 1989; Gilliom et al., 1989; Presser et al., 1990; Presser et al., 1994; Presser, 1994b). The most Se-rich region of the SJV is the Panoche Creek alluvial fan which supports intensively irrigated land (Tidball et al., 1986; 1989). Salts and Se build-up on soils as a result of both the arid climate (i.e., less than 10 inches of precipitation and greater than 90 inches of evaporation) and poor drainage (i.e., clay layers impede downward movement of water causing water-logging of the root zone).

The SJV has a net negative annual water budget (evaporation exceeds precipitation). Prior to development of the water management system, a permanent shallow groundwater table only occurred in groundwater discharge zones near the SJV trough. The present shallow ground water and attendant subsurface drainage flows are mainly the result of water management including massive irrigation. Micro-management seemingly has enabled agricultural production to continue at a high rate without excessive abandonment of lands.

Massive irrigation leaches salt and Se and moves them into aquifers and surface waters. Installation of subsurface drains increases the speed, volume, and control of the drainage of shallow groundwater that impedes agricultural production. Collection of drainage from irrigated soils in drainage canals